

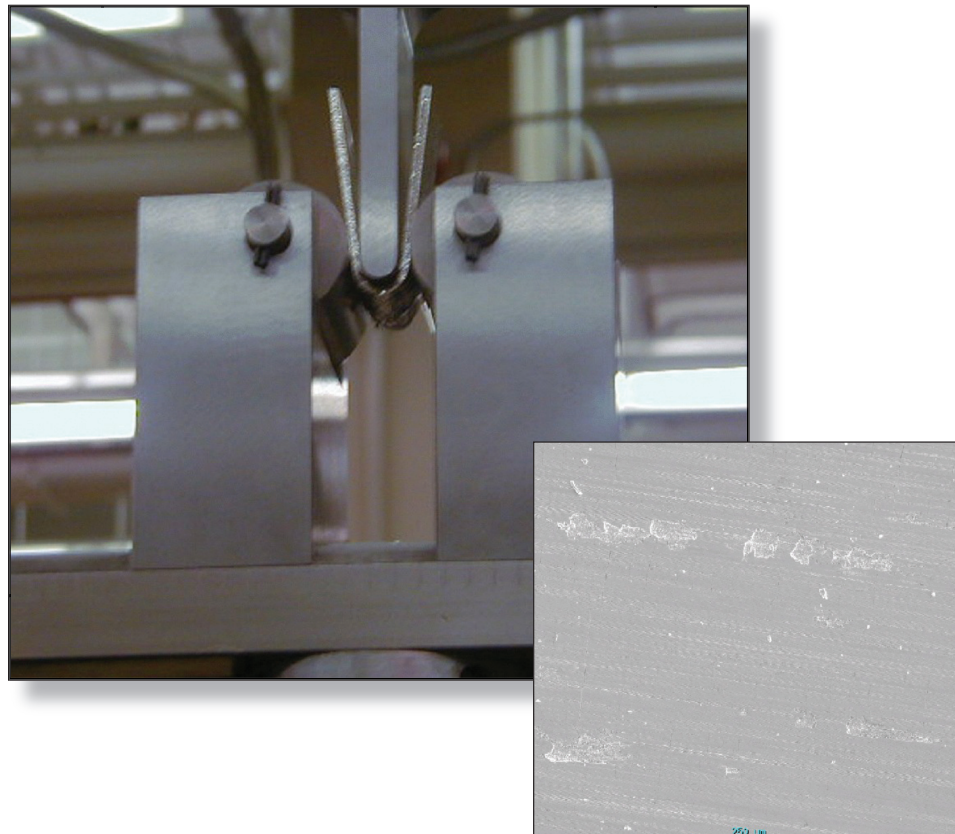


# Air Force Research Laboratory|AFRL

*Science and Technology for Tomorrow's Air and Space Force*

## **Success Story**

### **MATERIALS AND MANUFACTURING DIRECTORATE ENGINEERS EVALUATE NLOS HARD CHROME ALTERNATIVES**



Implementation of a non-line-of-sight (NLOS) hard chrome alternative for the coating of aircraft engine and landing gear components will help to eliminate growing environmental compliance and disposal problems associated with hard chromium plating. An alternative technology that can be easily incorporated into Air Force Air Logistics Center (ALC) maintenance operations is expected to significantly reduce worker exposure to carcinogenic materials.



Air Force Research Laboratory  
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## Accomplishment

Engineers from the Materials and Manufacturing Directorate Systems Support Division's Pollution Prevention Group are conducting a project funded by Air Force Materiel Command's Weapon System Pollution Prevention Program to identify, demonstrate, validate, and implement alternatives to electrolytic hard chrome (EHC) plating processes for parts that have NLOS coating requirements. The project is designed to complement the use of high velocity oxygen fuel (HVOF) thermal spraying of tungsten-carbide cobalt.

HVOF technology is the primary coating process the Air Force is transitioning to replace hard chromium plating. However, it is limited to line-of-sight applications and cannot accommodate components with internal surfaces, blind holes, and complex geometries.

## Background

EHC plating is extensively used to rebuild, rework, and repair worn components during the overhaul of aircraft engines and landing gear assemblies. EHC plating provides a coating with desirable metallurgical properties such as hardness, wear resistance, corrosion resistance, and lubricity. However, EHC plating involves the use of hexavalent chromium, which is a known carcinogen, and its use and disposal are strictly controlled by federal and state regulatory agencies. Implementation of these regulations has resulted in higher disposal costs and increased liability and risk for the Air Force.

The Air Force and other Department of Defense organizations are currently transitioning HVOF thermal spray technology to replace EHC plating. However, the process is limited to line-of-sight applications for parts having simple shapes and no internal surface coating requirements. Therefore, the process is not able to coat 20–40% of aircraft engine and landing gear components.

To date, hardness, profilometry (smoothness of coating), composition, quality and Taber wear testing of vendor supplied coatings has been accomplished. Additional evaluations will be conducted, including corrosion-resistance, fatigue, hydrogen embrittlement, wear, grindability, and strippability.

The ALC plating shops at Tinker Air Force Base, Oklahoma, and Hill Air Force Base, Utah, have been active participants in the decision making process from the beginning and will eventually plate test specimens with the best performing coating in order to prove that an acceptable coating can be applied in a production environment. The final phase of this project will be the development of an ALC implementation plan that will facilitate the transition of the new process into their maintenance operations. The project is expected to be completed by 2005.

## Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (04-ML-05)